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**Federal Aviation  
Administration**

# Advisory Circular

Subject:

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Change:

**GROUND DEICING AND ANTI-ICING  
PROGRAM**

1. PURPOSE. This advisory circular (AC) provides one means, but not the only means, for obtaining approval of a Ground Deicing and Anti-Icing Program, and for ensuring compliance with the Federal Aviation Regulations (FAR) Section 121.629.

2. RELATED FAR SECTIONS.

a. Part 121, Subpart E - Approval of Routes: Domestic and Flag Air Carriers. Sections 121.105-107.

b. Part 121, Subpart F - Approval of Areas and Routes for Supplemental Air Carriers and Commercial Operators. Sections 121.123-127.

c. Part 121, Subpart G - Manual Requirements. Section 121.135.

d. Part 121, Subpart L - Maintenance, Preventive Maintenance, and Alterations. Sections 121.363(b), 121.365-369, and 121.375.

e. Part 121, Subpart M - Airman and Crewmember Requirements. Sections 121.383(a)(3), 121.401-403, 121.405, 121.415, 121.418-419, 121.422, and 121.427.

f. Part 121, Subpart O - Crewmember Qualifications. Section 121.433.

g. Part 121, Subpart P - Aircraft Dispatcher Qualifications and Duty Time Limitations: Domestic and Flag Air Carriers. Section 121.463.

h. Part 121, Subpart T - Flight Operations. Sections 121.533, 121.537, and 121.539.

i. Part 121, Subpart U - Dispatching and Flight Release Rules. Section 121.629.

j. Special Federal Aviation Regulation No. 58. Advanced Qualification Program.

3. RELATED READING MATERIAL. The following material should be useful in developing training program subject material and instructions, and procedures for incorporation in the certificate holder's manuals:

a. AC 20-117, Hazards Following Ground Deicing and Ground Operations in Conditions Conducive to Aircraft Icing.

b. AC 120-58, Pilot Guide for Large Aircraft Ground Deicing.

c. FAA publication, Winter Operations Guidance for Air Carriers and Other Adverse Weather Topics.

Note: AC 20-117, AC 120-58, and the FAA publication may be obtained from the Department of Transportation, M-443.2, General Services Section, Washington, DC 20590.

d. Publications of the Society of Automotive Engineers (SAE): Aerospace Materials Specification (AMS) 1424, "Deicing/Anti-Icing Fluid, Aircraft, Newtonian - SAE Type I;" AMS 1428, "Fluid, Aircraft Deicing/Anti-Icing, Non-Newtonian, Pseudo-Plastic, SAE Type II;" and Aerospace Recommended Practice (ARP) 4737, "Aircraft Deicing/Anti-Icing Methods with Fluids, for Large Transport Aircraft." You can obtain copies of these documents by writing to the Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, Pennsylvania, 15096-0001.

e. Publications of the International Standards Organization (ISO): ISO 11075, "Aerospace - Aircraft Deicing/Anti-Icing Newtonian Fluids ISO Type I;" ISO 11076, "Aerospace - Aircraft Deicing/Anti-Icing Methods with Fluids;" ISO 11077, "Aerospace - Deicing/Anti-Icing Self Propelled Vehicles - Functional Requirements;" and ISO 11078, "Aerospace - Aircraft Deicing/Anti-Icing Non-Newtonian Fluids ISO Type II." Copies of these documents can be obtained from American National Standards Institute, 11 West 42nd Street, New York, New York, 10036, (212) 642-4900.

#### 4. BACKGROUND.

a. Accidents Related to Icing. According to information received in 1992 from the National Transportation Safety Board (NTSB), in the last 23 years there have been 15 accidents involving FAR Part 121 operators related to the failure to deice and/or anti-ice aircraft adequately before takeoff. On March 22, 1992, an airplane operated by a U.S. air carrier crashed on takeoff from LaGuardia Airport in a snowstorm during nighttime operations. The NTSB determined that the probable causes of this accident were failure of the airline industry and the Federal Aviation Administration (FAA) to provide flightcrews with

procedures, requirements, and criteria compatible with departure delays in conditions conducive to airframe icing and the decision by the flightcrew to take off without positive assurance that the airplane's wings were free of ice accumulation after prolonged exposure to precipitation following deicing.

b. Reassessment of Icing Procedures. Prior to the LaGuardia accident, the FAA and the aviation community, in general, had placed priority on emphasizing the need during icing conditions for the pilot in command (PIC) to ensure a "clean aircraft" before takeoff. The FAA believed that pilot education appeared to be key to combatting the threat of wing icing. The FAA still believes the PIC ultimately must make the decision on whether or not to take off, based on a thorough understanding of factors involved in aircraft icing; however, the FAA has determined that certificate holders conducting operations under FAR Part 121 must provide their PIC's with pertinent information and operator-developed procedures and criteria so that the PIC will be able to make a proper decision.

c. Content of this AC. Accordingly, this AC provides guidance about the program elements that should be incorporated in an certificate holder's approved ground deicing and anti-icing program. It provides guidance and suggestions about methods, but not the only methods, for complying with all pertinent regulations.

5. DEFINITIONS. The terms used in this AC are not defined in FAR Part 1. They are defined here for a better understanding of this material.

a. Holdover Time. The estimated time deicing or anti-icing fluid will prevent the formation of frost or ice and the accumulation of snow on the protected surfaces of an aircraft. Holdover time begins when the final application of deicing/anti-icing fluid commences and expires when the deicing/anti-icing fluid applied to the aircraft loses its effectiveness.

b. Deicing. A procedure by which frost, ice, or snow is removed from the aircraft in order to provide clean surfaces.

c. Anti-Icing. A precautionary procedure that provides protection against the formation of frost or ice and accumulation of snow on treated surfaces of the aircraft for a limited period of time.

d. Pretakeoff Check. A check of the aircraft's wings or representative aircraft surfaces for frost, ice, or snow

conducted within the aircraft's holdover time.

e. Pretakeoff Contamination Check. A check to make sure the aircraft's wings, control surfaces, and other critical surfaces, as defined in the certificate holder's program, are free of frost, ice, and snow. It must be completed within 5 minutes prior to beginning takeoff. This check must be accomplished from outside the aircraft unless the certificate holder's program specifies otherwise.

f. Outside-the-Aircraft Check. A check to ensure that the wings and control surfaces are free of frost, ice, and snow. It must be completed within 5 minutes prior to beginning takeoff. It must be accomplished from outside the aircraft.

6. PROGRAM ELEMENTS. FAR Section 121.629(c) requires a certificate holder's ground deicing and anti-icing program include at least the following elements:

a. Management plan including a detailed description of the operational responsibilities and procedures associated with the implementation and conduct of the certificate holder's ground deicing/anti-icing program.

b. A certificate holder's holdover timetables and procedures for the use of these tables by the certificate holder's personnel.

c. Aircraft deicing/anti-icing procedures and responsibilities, pretakeoff check procedures and responsibilities, and pretakeoff contamination check procedures and responsibilities.

d. Initial and recurrent ground training and testing for flight crewmembers and qualification for all other affected personnel (e.g., aircraft dispatchers, ground crews, contract personnel).

7. MANAGEMENT PLAN. FAR Sections 121.533, 121.535, and 121.537 state, respectively, that each domestic, flag, and supplemental air carrier and commercial operator is responsible for operational control. In order to properly exercise operational control (when conditions at an airport are such that frost, ice, or snow may reasonably be expected to adhere to its aircraft), the certificate holder should develop, coordinate with other affected parties, implement, and use a management plan to ensure proper execution of its approved deicing/anti-icing program. The FAA would accept an operator's management plan that identifies the manager responsible for the overall deicing/anti-icing

program, identifies each subordinate manager, and describes each manager's functions and responsibilities under the applicable FAR which are needed to properly manage the certificate holder's deicing/anti-icing program. A plan encompassing the elements discussed in the following paragraphs is acceptable:

a. Operations. Determine the management position responsible for ensuring that all the elements of the management plan and the deicing/anti-icing program have been developed, properly integrated, and coordinated; that the plan and program have been disseminated to all those persons who have duties, responsibilities, and functions to perform in accordance with them; and that adequate management oversight of the program continues to be maintained. The following should be considered:

(1) At each airport where operations are expected to be conducted in conditions conducive to ground icing, determine who will be responsible for deciding when ground deicing/anti-icing operational procedures are to be implemented.

(2) Specify the functions, duties, responsibilities, instructions, and procedures to be used by flight crewmembers, aircraft dispatchers or flight followers, and management personnel for safely dispatching or releasing each type aircraft used in its operations while ground deicing/anti-icing operational procedures are in effect. A plan should include a detailed description of how the certificate holder determines that conditions at an airport are such that frost, ice, or snow may reasonably be expected to adhere to the aircraft, and when ground deicing/anti-icing operational procedures must be in effect.

(3) Determine who will be responsible for coordinating the applicable portions of the management plan and the deicing/anti-icing program with the appropriate air traffic control tower (ATCT) personnel and other appropriate airport authorities, including:

(i) Determine who will be authorized to enter into agreements with the manager of the ATCT at each airport regarding air traffic control (ATC) procedures during ground icing conditions, and with each airport's manager regarding aircraft secondary deicing/anti-icing locations and where aircraft may conduct pretakeoff contamination checks; and

(ii) Ensure that a detailed description of the deicing/anti-icing program is incorporated in the certificate holder's manuals for flight crewmembers, dispatchers or flight followers, ground operations personnel, and management personnel

to use in conducting operations under ground icing conditions.

b. Maintenance. Determine who is responsible for ensuring that enough trained and qualified personnel, as well as adequate facilities and equipment, are available at each airport where operations are expected to be conducted under conditions conducive to ground icing for the proper deicing and anti-icing of the certificate holder's aircraft. The following should be considered:

(1) Ensure that all necessary maintenance elements of the management plan and the deicing/anti-icing program have been developed, properly integrated, and coordinated; that the maintenance plan and deicing/anti-icing program have been disseminated to all those personnel who have duties, responsibilities, and functions to perform; and that adequate management oversight of the program continues to be maintained.

(2) Detail the functions, duties, responsibilities, instructions, and procedures to be used by its ground personnel, maintenance personnel, and management personnel for safely dispatching or releasing aircraft used in its operations while ground deicing/anti-icing operational procedures are in effect.

(3) Ensure that a detailed description of the maintenance portion of the deicing/anti-icing program is incorporated in the certificate holder's manuals for the use and guidance of maintenance, ground, flightcrew, and management personnel.

8. HOLDOVER TIMETABLES AND PROCEDURES FOR THEIR USE. FAR Section 121.629(c)(3) requires that the deicing/anti-icing program include holdover timetables and the procedures for the use of these tables by the certificate holder's personnel. An acceptable program includes procedures to be followed in the event that the holdover times, as determined by the PIC from the certificate holder's holdover time tables, are exceeded. Each of these areas is discussed in the following paragraphs and illustrated in figure 1.

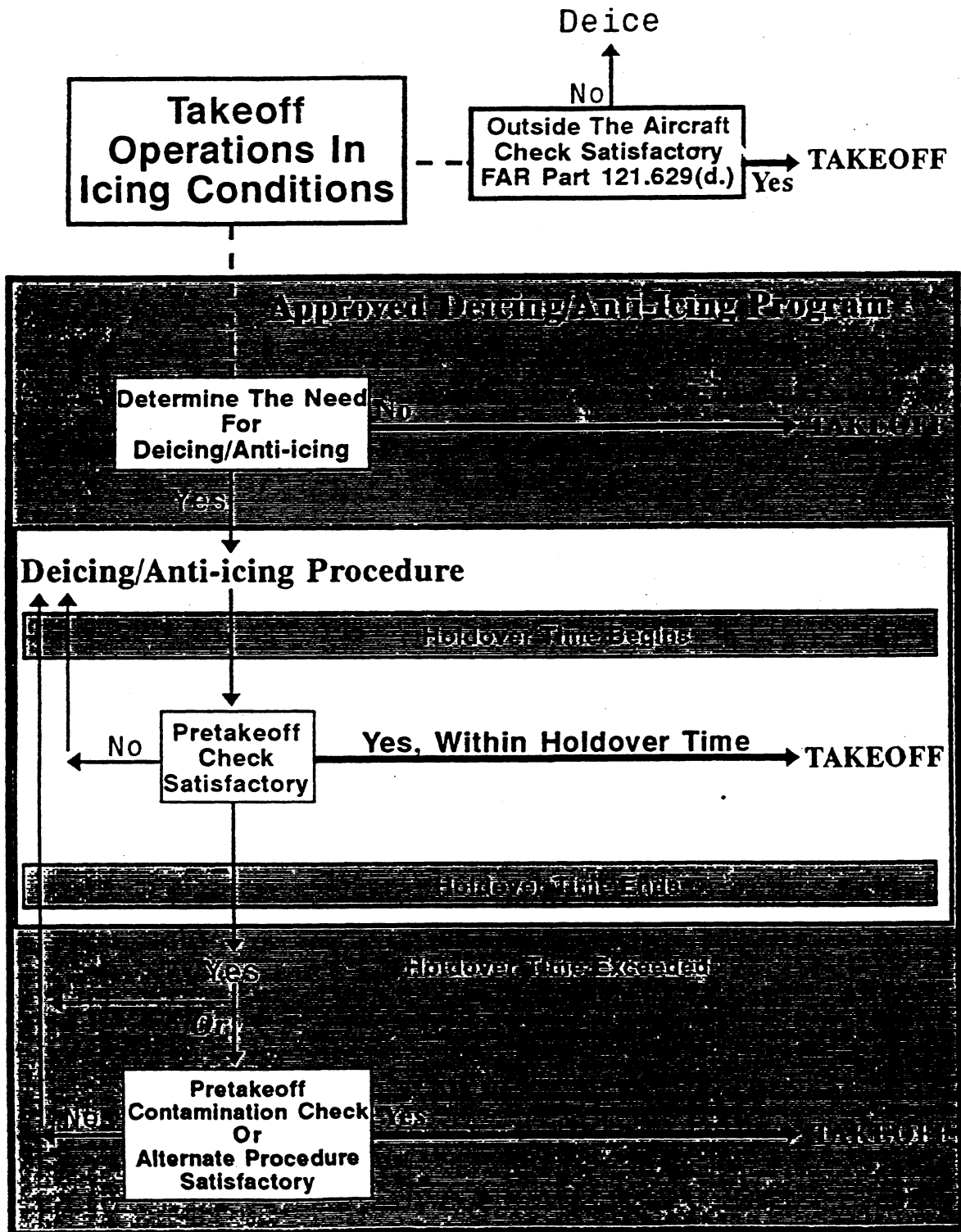
Note: The procedures for the use of the holdover timetables requires a pretakeoff check by the flightcrew. To effectively use holdover timetables, they should be available in the cockpit for flightcrews to use.

a. Responsibilities and Procedures. The certificate holder's program should define operational responsibilities and contain procedures for the flightcrew, aircraft dispatchers, flight followers, and maintenance and ground personnel applicable

to the use of holdover times and resultant actions if the determined holdover time is exceeded. These procedures should include gate procedures, communication between ground crew and flightcrew to establish the start of holdover time and to relay other pertinent information regarding the deicing/anti-icing process, flight crewmember use of the pertinent holdover timetables, coordination with dispatchers or flight followers, and coordination with ATC.

b. Development of Holdover Timetables. Except as provided in FAR Section 121.629(d), each certificate holder is required under FAR Section 121.629(c)(3) to develop holdover timetables for use by its personnel. These timetables are required to be supported by data acceptable to the Administrator. Currently, the only acceptable data is that developed by SAE and ISO. ARP 4737, "Aircraft Deicing/Anti-Icing Methods with Fluids, for Large Transport Aircraft," and ISO 11076, "Aerospace - Aircraft Deicing/Anti-Icing Methods with Fluids," contain the tables that are currently considered acceptable for use by the certificate holders to develop their holdover timetables. Holdover times exceeding those specified in the current editions of the SAE and ISO tables are currently not acceptable; however, the certificate holder may require the use of more conservative times than those specified in the SAE and ISO tables. Appendix 1 of this AC contains the holdover timetables extracted from the current SAE and ISO documents.

FIGURE 1  
TAKEOFF OPERATIONS IN ICING CONDITIONS





c. Use of Holdover Timetables. Holdover time ranges are only an estimate of the time that deicing/anti-icing fluid will prevent the formation of frost or ice and the accumulation of snow on the protected surfaces of an aircraft. Holdover time begins when the final application of deicing/anti-icing fluid commences and expires when the deicing/anti-icing fluid applied to the aircraft loses its effectiveness. Holdover times vary with weather conditions; the holdover time determined should be appropriate for the existing weather conditions. For example, appendix 1, table 1, gives "0:15 - 0:30" (meaning a range of 15 to 30 minutes) for snow in the outside air temperature (OAT) range of 19°F to 32°F for a 75/25 mixture of SAE/ISO Type II fluid. The proper interpretation of this particular time range is that under various weather conditions and the other conditions stated in the table, the estimated holdover time range may be between 15 minutes and 30 minutes. Generally, for snow, the lower range has been found to be a useful approximation for moderate, steadily falling snow (zero to light winds) while the upper range is a useful approximation for light, steadily falling snow. Therefore as a general rule, the maximum time within the holdover time range applies in light precipitation conditions, and the minimum time applies to moderate precipitation conditions. It should be noted the SAE and ISO holdover timetables specifically state that holdover time protection will be shortened in heavy weather conditions. The effectiveness of deicing/anti-icing fluids is based on a number of variables (e.g., temperature, moisture content of the precipitation, wind, and aircraft skin temperature). The holdover timetables are to be used for departure planning and in conjunction with pretakeoff check procedures. FAR Section 121.629(c)(3) requires the program include procedures for the use of holdover timetables including conducting pretakeoff check(s). A pretakeoff check as defined in FAR Section 121.629(c)(4) is a check of the aircraft's wings or representative aircraft surfaces for frost, ice, or snow within the aircraft's holdover time. Depending on the length of the holdover time, weather, or other conditions, pretakeoff check procedures may be accomplished several times during the aircraft's holdover time. A pretakeoff check should be accomplished just prior to taking the active runway for departure. Air carrier manuals should contain detailed procedures for using holdover timetables and the conduct of pretakeoff checks in their operations.

d. FAR Section 121.629(c)(3) also requires the certificate holder's program contain procedures for flight crewmembers to increase or decrease the determined holdover time in changing conditions. This requires the flightcrew to maintain a continued awareness of environmental or situational conditions that could

affect the determined holdover time. Weather conditions that could result in a change to the determined holdover time include, but are not limited to, a significant rise or drop in ambient temperature, an increase or decrease in precipitation rate or intensity, water content, or density, a change in type of precipitation; e.g., rain to freezing rain, light to heavy snow, or the end of precipitation. Procedures should consider the certificate holder's capability to disseminate information, in real time, concerning changing weather conditions. Additional guidance regarding holdover timetables is contained in AC 20-117, Hazards Following Ground Deicing and Ground Operations in Conditions Conducive to Aircraft Icing; AC 120-58, Pilot Guide for Large Aircraft Ground Deicing; SAE ARP 4737, "Aircraft Deicing/Anti-Icing Methods with Fluids, for Large Transport Aircraft"; and ISO 11076, "Aerospace - Aircraft Deicing/Anti-Icing Methods with Fluids."

e. Takeoff After the Holdover Time is Exceeded. Under FAR Section 121.629(c)(3), takeoff after the determined holdover time is exceeded is permitted only if one of the three conditions described in e.(1)(2)(3) exists. The certificate holder's program should detail actions that must be accomplished if the holdover time is exceeded.

(1) A pretakeoff contamination check is completed to make sure that wings, control surfaces, and other critical surfaces, as defined in the certificate holder's program, are free of frost, ice, and snow. The operator's program must include detailed aircraft type-specific procedures and responsibilities for flightcrew and ground personnel to use while accomplishing this check. This check must be completed within 5 minutes prior to beginning takeoff and must be accomplished from outside the aircraft, unless the certificate holder's program specifies otherwise. Factors determining whether the check can be accomplished from inside the aircraft include the ability of the flightcrew to see aircraft surfaces, lighting conditions, weather conditions, as well as other factors which determine the flightcrew's ability to assess the condition of the aircraft. The certificate holder's program should emphasize that if any doubt exists as to the condition of the aircraft after completing this check from inside the aircraft, the takeoff must not be attempted. If doubt exists, the PIC should request a pretakeoff contamination check be accomplished from outside the aircraft or the aircraft should be redeiced and a new holdover time determined; or

(2) It is otherwise determined by an alternate procedure, that wings, control surfaces, and other critical surfaces, as defined in the certificate holder's program, are

free of frost, ice, and snow. Alternative procedures consist of procedures, techniques, or equipment (such as wing icing sensors) that might be used to establish that the above mentioned surfaces are not contaminated. Any alternative procedure must be approved by the certificate holder's principal operations inspector through the Manager, Air Transportation Division, AFS-200, and the procedures should be included in the certificate holder's approved program; or

(3) The wings, control surfaces, and other critical surfaces have been redeiced and a new holdover time has been determined. Coordination procedures with ATC and ground personnel should be detailed for the accomplishment of this redeicing.

**9. AIRCRAFT DEICING/ANTI-ICING PROCEDURES AND RESPONSIBILITIES, PRETAKEOFF CHECK PROCEDURES AND RESPONSIBILITIES, AND PRETAKEOFF CONTAMINATION CHECK PROCEDURES AND RESPONSIBILITIES.** Certificate holders' manuals should contain detailed procedures for the deicing and anti-icing process specific to each aircraft type. Certificate holders should have aircraft type-specific instructions and checking guidelines and procedures for the use of their flight crewmembers and other personnel to determine whether or not aircraft surfaces are free of contaminants.

**Note:** Takeoffs with underwing frost in the area of the fuel tanks within limits established by the aircraft manufacturer, accepted by FAA aircraft certification offices, and stated in aircraft maintenance and flight manuals can be authorized by the FAA.

a. **Identification of Critical Aircraft Surfaces.** The critical aircraft surfaces which should be clear of contaminants before takeoff should be described in the aircraft manufacturer's maintenance manual or other manufacturer-developed documents, such as service or operations bulletins.

(1) Generally, the following should be considered to be critical aircraft surfaces, if the aircraft manufacturer's information is not available:

(i) Pitot heads, static ports, ram-air intakes for engine control and flight instruments, other kinds of instrument sensor pickup points, fuel vents, propellers, and engine inlets.

(ii) Wings, empennage, and control surfaces.

(iii) Fuselage upper surfaces on aircraft with center mounted engine(s).

(2) Certificate holders should list in the flight manual or the operations manual, for each type of aircraft used in their operations, the critical surfaces which should be checked on flight-crewmember-conducted preflight inspections, pretakeoff checks, and pretakeoff contamination checks.

(3) Critical surfaces should be defined for the use of ground personnel for conducting the check following the deicing/anti-icing process and for any pretakeoff contamination checks that may be accomplished by ground personnel.

b. Identification of Representative Aircraft Surfaces (for use in conducting pretakeoff checks only). Certificate holders should list in the flight manual or the operations manual, for each type of aircraft used in their operations, the representative surfaces which may be checked while conducting pretakeoff checks.

(1) Some aircraft manufacturers have identified certain aircraft surfaces which the flightcrew can readily observe to determine whether or not ice, frost, or snow is accumulating or forming on that surface and, by using it as a representative surface, can make a reasoned judgement regarding whether or not ice, frost, or snow is adhering to other aircraft surfaces. Certificate holder operational experience can also be used to define representative surfaces. In the absence of this information, the following guidelines should be considered in identifying a representative aircraft surface:

(i) The surface can be seen clearly to determine whether or not ice, frost, or snow is forming or accumulating on the surface.

(ii) The surface should be unheated.

(iii) Surfaces such as windshield wipers should also be considered.

(iv) The surface should be one of the first surfaces treated with deicing/anti-icing fluid during the deicing/anti-icing procedure; however, designation of representative surfaces is not limited to treated surfaces.

c. Techniques for Recognizing Contamination on Aircraft Critical or Representative Surfaces. In annual and recurrent training, certificate holders must include aircraft type-specific techniques for flight crewmembers and other personnel for recognizing contamination on critical and representative aircraft surfaces. These type-specific techniques should be used while

conducting preflight aircraft icing checks, pretakeoff checks, and pretakeoff contamination checks. Some indications for loss of effectiveness of deicing/anti-icing fluid or contamination on aircraft surfaces include surface freezing or snow accumulation, random snow accumulation, and dulling of surface reflectivity (loss of gloss) caused by the gradual deterioration of the fluid to slush. Deicing/anti-icing fluid manufacturers should also be consulted for information on the fluid characteristics and indications that the fluid is losing its effectiveness.

d. Types of Icing Checks. FAR Section 121.629(c)(4) identifies three different icing checks or procedures which, when applicable, are required to be accomplished under an operator's approved deicing/anti-icing program:

(1) Aircraft Deicing/Anti-Icing Procedure. The aircraft deicing/anti-icing procedure includes a check of the wings, control surfaces, propellers, engine inlets, and other critical surfaces. This check is an integral part of the deicing/anti-icing procedure. Certificate holders should have procedures which ensure that, following aircraft deicing and anti-icing fluid application, this check is conducted by qualified ground personnel. This check determines if the wings, control surfaces, propellers, engine inlets, and other critical surfaces are free of frost, ice, or snow before pushback or taxi. It should be noted that, for airplanes not equipped with wing clear-ice detectors, a tactile check of airplane surfaces is the only known method to date to verify whether or not the surfaces are uncontaminated. Communication procedures should be established to relay pertinent deicing/anti-icing information and the results of this check to the PIC.

(2) Pretakeoff Check. This check is aircraft type-specific and is required under FAR Section 121.629(c)(3) anytime procedures for the use of holdover times are required. It must be accomplished within the holdover time, and is normally accomplished by the flightcrew from inside the cockpit. The aircraft's wings or representative aircraft surfaces are checked for contamination. The surfaces to be checked are determined by manufacturer's data, carrier's operational experience, or guidance contained in this AC. The pretakeoff check is integral to the use of holdover times. Because of the limitations and cautions associated with the use of holdover times, the flightcrew must assess the current weather, other situational conditions, and the aircraft's condition, and not rely on the use of holdover times as the sole determinant that the aircraft is free of contaminants. Several pretakeoff checks may be required during the holdover time period based on factors including the length of the holdover time range, weather, or other conditions.

A continued awareness of the aircraft condition should be maintained. A pretakeoff check should be accomplished just prior to taking the active runway for departure.

(3) Pretakeoff Contamination Check. FAR Section 121.629(c)(3)(i) states that completing a pretakeoff contamination check is one of the conditions that allows a takeoff after a holdover time has been exceeded. Certificate holders must have appropriate pretakeoff contamination check procedures for flight crewmembers and other qualified ground personnel's use to ensure that the aircraft wings, control surfaces, and other critical surfaces remain free of frost, ice, and snow when a holdover time has been exceeded. The pretakeoff contamination check must be completed within 5 minutes prior to beginning takeoff and must be accomplished from outside the aircraft unless the certificate holder's program specifies otherwise. Reliance on representative surfaces are not satisfactory for determining the aircraft is free of contamination while conducting this check. If any doubt exists concerning the aircraft's condition after completing this check, the aircraft cannot take off unless it is redeiced and a new holdover time determined. The following should be considered while developing procedures for this check.

(i) Certificate holders who operate hard-wing airplanes with aft, fuselage-mounted, turbine-powered engines should conduct pretakeoff contamination checks from outside the airplane, unless otherwise authorized in the certificate holder's approved program. The pretakeoff contamination check for these airplanes should include a tactile check of selected portions of the wing leading edges and the upper wing surfaces. Alternatives to a tactile check procedure may be approved. Alternative procedures must be coordinated with the Manager, Air Transportation Division, AFS-200. As of the date of this AC, only one airplane manufacturer has developed an approved alternative to tactile pretakeoff contamination checks. This procedure is contained in the manufacturer's maintenance manual and details the requirements for conducting this check.

(ii) Operators of other aircraft must conduct this check from outside the aircraft unless they can show that the check can be adequately accomplished from inside the aircraft, as specified in the certificate holder's program. The program must detail procedures and requirements for the conduct of this check. Certificate holders should consider the following in the development of guidelines for conducting pretakeoff contamination checks from inside the aircraft:

(A) Can enough of the wings, control surfaces, and other critical surfaces be seen to accurately determine whether or not they are free of contaminants? This determination should consider the aircraft type, the method of conducting the check--that is, from the cockpit or cabin, and other factors including aircraft lighting and other ambient conditions.

(B) Does the certificate holder have procedures to recognize, and have flight crewmembers been properly trained on these procedures to recognize, changes in weather conditions so they will be able to determine if the wings, control surfaces, and other critical aircraft surfaces could reasonably be expected to remain free of contamination?

10. INITIAL AND RECURRENT GROUND TRAINING AND TESTING FOR FLIGHT CREWMEMBERS AND INITIAL AND RECURRENT GROUND TRAINING AND QUALIFICATION FOR DISPATCHERS.

a. Flight Crewmember Training and Testing. The operator's training program must include a detailed description of initial and annual recurrent ground training and testing for flight crewmembers concerning the specific requirements of the program and the duties, responsibilities, and functions detailed in the program. Flight crewmembers and dispatchers must be trained and tested or qualified on at least the following subjects (after each subject listed, recommendations concerning the content of the training are provided):

(1) The Use of Holdover Times. Holdover times are a range of times derived from an analysis of airline experience and laboratory testing of the freeze points of particular types of fluids (currently Type I and Type II) under various temperatures, fluid concentrations, and humidity conditions. A discussion of holdover times should include the following:

(i) Definition of holdover time.

(A) Limitations and cautions associated with the use of holdover times.

(B) Source of holdover time data.

(C) How to determine a specific holdover time from the holdover time range that accounts for "heavy," "medium," or "light" weather conditions.

(D) Adjusting holdover time for changing weather conditions.